



ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY

Experience Implementing Energy Standards for Commercial Buildings and Its Lessons for the Philippines

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**Environmental Energy
Technologies Division**

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1 Introduction

Energy efficiency standards¹ for buildings have been adopted in over forty countries. This policy mechanism is pursued by governments as a means of increasing energy efficiency in the buildings sector, which typically accounts for about a third of most nations' energy consumption and half of their electricity consumption.

Commercial buildings are an attractive target for government attention for a number of other reasons. Once built they are long-lived, extending sometimes beyond the life span of the energy infrastructure put in place to supply them. Energy efficiency opportunities are more widespread and cost effective prior to construction of buildings, so policies such as standards that focus attention on these opportunities during the design phase are especially advantageous. The structure of the market for buildings is such that the developer or owner of the commercial building is often not responsible for paying the energy bills it incurs. This means in the absence of energy standards or other inducements, there is little incentive for such developers or owners to investigate or invest in energy efficiency opportunities however attractive they might be to other stakeholders or to society as a whole.

Energy standards can often fit into an existing framework and institutional infrastructure for regulating buildings. Most countries have standards in place at the national, regional, and/or local levels for regulating health and safety concerns in buildings. Energy standards are often added as a component to these health and safety standards and carried out through similar processes.

A previous survey addressed the presence and content of energy standards for buildings worldwide (Janda and Busch, 1994). Much of the effort and published work on commercial building energy standards for buildings has focused on issues related to their design and development. Yet there are important aspects to energy standards that take place subsequent to their development, what we will refer to as the "implementation" stage. Implementation encompasses both startup activities to launch the standard and ongoing activities to maintain an operation and improve it over time. These activities can include training; marketing, promotion, and advertising; staffing and institution building; field testing, enabling compliance; evaluation; revision and updates; or others. Implementation is where "the rubber meets the road" and probably exerts more influence on how much energy is ultimately saved than the content of the standard does.

This study reports on experience with implementation of energy standards for commercial buildings in a number of countries and U.S. states. It is conducted from the perspective of providing useful input to the Government of the Philippines' (GOP) current effort at implementing their building energy standard. While the impetus for this work is technical assistance to the Philippines, the intent is to shed light on the broader issues attending implementation of building energy standards that would be applicable there and elsewhere. The background on the GOP building energy standard is presented below, followed by the objectives for the study, the approach used to collect and analyze information about other jurisdictions' implementation experience, results, and conclusions and recommendations.

¹ We use the word "standard" to refer interchangeably to what also might be called codes, criteria, guidelines, norms, laws, protocols, provisions, recommendations, requirements, regulations, or rules.

2 Background

In the late 1980s to early 1990s, the Philippines along with several other countries in Southeast Asia adopted energy standards for commercial buildings. These standards were developed with technical assistance provided by the Lawrence Berkeley National Laboratory (LBNL) under sponsorship of the U.S. Agency for International Development (USAID) (Deringer and Busch, 1990). The standards adopted by these countries were modeled after the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1 for non-residential buildings (ASHRAE, 1989) and the standard adopted by Singapore in 1979. In each country, committees comprised of local government officials, professionals, and other building industry representatives adapted the standard to local conditions of weather, construction practice, and desired stringency. Each country adopted the standard as either voluntary or mandatory, and implemented it according to local political dictates.

In the Philippines, the course of the building energy standard has evolved as follows (Elauria, 1996). The building energy standard was initially developed between 1988 and 1989 under the leadership of the Philippines Department of Energy (DOE). In 1990, a public hearing was held to solicit input from practitioners within the buildings industry. In 1992, the Department of Public Works and Highways (DPWH), which holds responsibility for issuing the National Building Code (NBC), approved the building energy standard as a Referral Code. In 1993, the building energy standard was advertised in the news media for several weeks. In 1994, the Philippines issued their building energy standard, “Guidelines for Energy Conserving Design of Buildings and Utility Systems,” which covers all new buildings with at least 150 kW of installed air-conditioning electrical demand (DOE, 1993). The NBC along with all associated referral codes is mandatory. However, the Guidelines have not been enforced, and by all accounts are not being followed (Leverage, 1997). At the time the Guidelines were issued, major changes were taking place in the way the NBC was implemented. Responsibility for compliance shifted to local jurisdictions under the Department of Interior and Local Government (DILG). No special measures have been taken to ensure that the Guidelines are incorporated into the duties of local officials assigned to enforce the NBC.

3 Objectives

In response to the Philippines situation just described, this study on implementation of building energy standards was devised with the following objectives in mind:

- to learn about building energy standards implementation approaches followed elsewhere
- to identify factors contributing to successful implementation
- to inform the Philippines’ process of implementing their standard and provide recommendations

4 Approach

Our approach was to survey countries and U.S. states where commercial² building energy standards have been enacted. We developed a 10 page questionnaire posing questions to knowledgeable local experts about status, coverage, implementation activities undertaken, organization structure, procedures in place, and impacts (see Appendix A). The questions were developed as an extension of the earlier survey work (Janda and Busch, 1994) and drew upon our collective experience working on building energy standards with countries on five continents.

The questions posed in the survey were built around a number of hypotheses. First, that a broad range of factors and implementation activities contribute to the success or failure of any standard. Some of these factors might include:

- Whether the standard is mandatory or voluntary
- Training
- Marketing
- Institutional, management, and technical capacity
- Means of gaining compliance
- Presence of champions
- Simplicity, clarity and ease of use
- Involvement of stakeholders in the standard development and revision processes
- Clear lines of authority for implementing standard

Second, that there are many ways of defining success of a standard, some obvious and relatively straightforward to measure (albeit possibly involved and costly), and others more subtle and difficult to measure. Measurability does not correlate with the importance of any particular indicator of success. Depending on the goals set out for the standard by any given jurisdiction, indicators of success will vary. Some indicators could include (shown roughly in order of increasing difficulty to measure):

- Use of standard as a performance benchmark (e.g. in a DSM program for new buildings)
- Level of compliance
- Energy and energy cost savings
- Falling life-cycle costs for buildings
- Extent of buildings exceeding standard
- Shift in building practice, including designs and equipment specified
- Fosters integrated design process with enhanced communication and coordination between architectural and engineering designers
- Awareness of standard and energy efficiency opportunities

5 Results

² Information on residential building energy standards implementation was not pursued because it was less relevant to the Philippines.

This section reports on results of the survey. Many of the respondents were unable to complete every question. Therefore, in reporting results, percentage responses for a given question are a function of the number of responses to that question.

5.1 Status of Standards

Responses on the implementation survey were received for 21 jurisdictions. These responses had overall results as follows:

- 15 had adopted an energy standard for commercial buildings
 - 4 on a voluntary basis
 - 11 on a mandatory basis
- 6 were in the process of either developing or implementing an energy standard at the present time.

5.2 Geographic Distribution of Responses

Mandatory Standards: The 11 responses reporting mandatory energy standards were distributed as follows:

- 5 from states in the US (Virginia, Minnesota, New Mexico, Florida, and California)
- 3 from Europe (Denmark, Germany, England & Wales³)
- 3 from Asia (Japan, South Korea, and Singapore)

Voluntary Standards: The 4 responses reporting voluntary energy standards were distributed as follows:

- 1 US state (Texas⁴)
- 1 from the Caribbean (Jamaica)
- 2 from Asia (Malaysia, Hong Kong)

Because of the overlap in responses from Texas, responses were received from just 4 separate jurisdictions reporting voluntary implementation.

Standards under development or being implemented: The 6 responses reporting energy standards under development or being implemented were distributed as follows:

- 3 from Africa (Senegal, South Africa, Ivory Coast)
- 1 from eastern Europe (Poland)
- 2 from Asia (China, Australia)

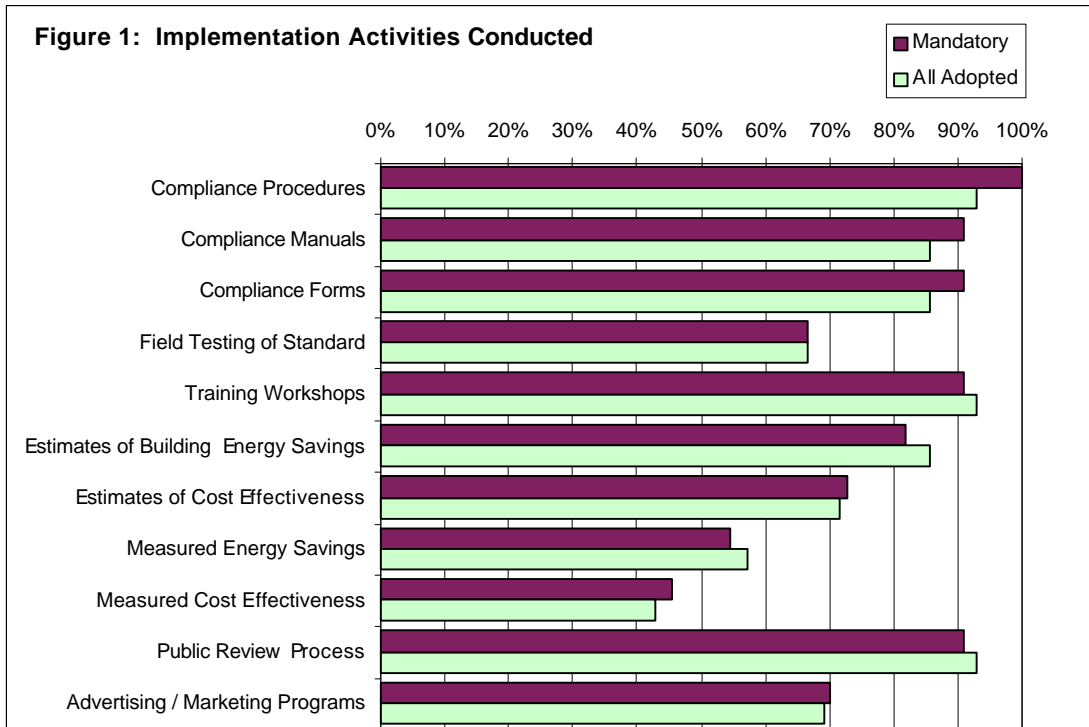
Since our focus is on implementation experience, these responses were not used in compiling the results reported on below.

5.3 Implementation Activities

A number of activities often are undertaken in implementing energy efficiency standards for commercial buildings. Figure 1 shows the pattern and percentage of responses to the questions asked.

³ England and Wales were included in the same response as a single jurisdiction.

⁴ Three responses were obtained for one jurisdiction in the US, Texas, and reconciled into a single response for purposes of reporting results.



For the “implementation activities” category, the response patterns for voluntary standards were quite similar to those for mandatory standards; the combined results are presented below.

5.3.1 Key Implementation Activities

In almost all cases, the adopting jurisdictions (~90%) accomplished 5 basic implementation activities; they:

- Developed compliance procedures
- Developed compliance manuals
- Developed compliance forms
- Conducted training workshops
- Conducted public review processes

Most jurisdictions had developed estimates of building energy savings (~80%) and cost-effectiveness (70%). However, fewer jurisdictions had actually tried to measure the actual energy savings (~50%) or to measure the cost-effectiveness (~40%). Just over half (~60%) had: field tested the standard and conducted advertising or marketing programs.

5.3.2 Additional Detail on Key Activities

Additional detail was reported for several implementation activities including public review training, and advertising / marketing.

Public review: this is reported to be a routine part of implementation processes in almost all jurisdictions. About half of the respondents did not know the general number of comments made

about the standard as part of a public review process. Of the half that did know the level of responses, there was an even split between those receiving less than 10 comments and about half report receiving 10-50 comments. One respondent reports receiving more than 100 comments.

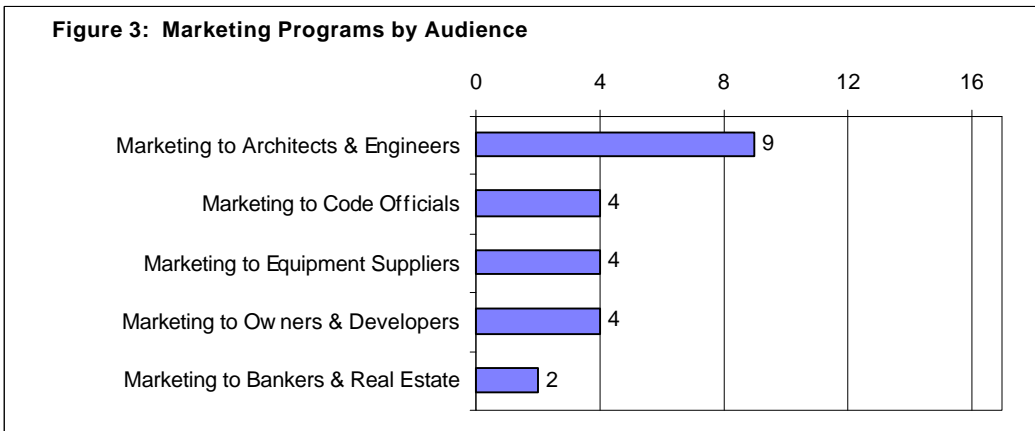
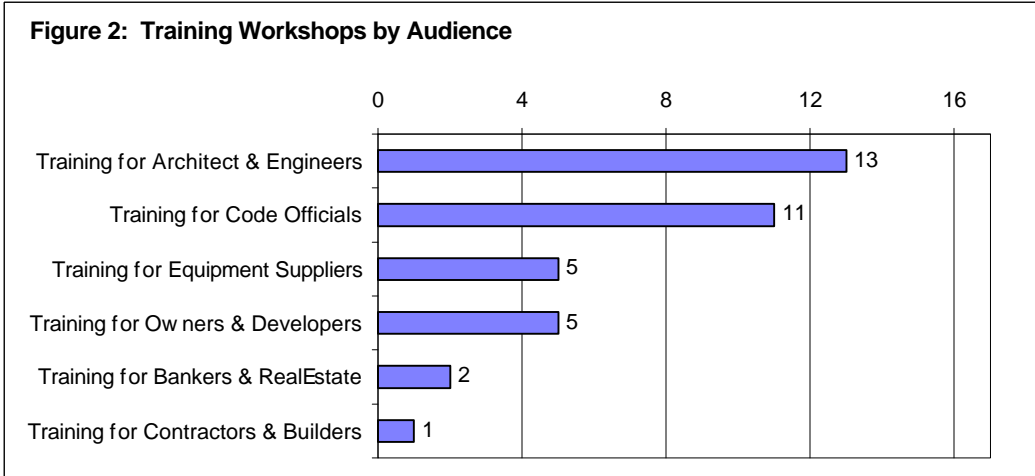
In all cases, the respondents report that only “modest” changes were made to the energy standard as a result of the public comment. No jurisdiction has reported “extensive” changes as a result of public comment.

The modest number of comments and the lack of reported extensive changes at first surprised us. In the US, the professional society ASHRAE has for over 20 years developed updates to its energy efficiency standard for commercial buildings (ASHRAE Standard 90.1). In the last update process, in the late 1980’s, and in the current update process, now underway⁵, the ASHRAE committee has made *extensive* changes to its proposed revisions in response to public comment. Also, the volume of public comment to proposed revisions the ASHRAE standard for commercial buildings has itself been substantial.

In the US, most energy standards are based on the ASHRAE standard. Thus, it is possible that the extensive give-and-take that is part of the ASHRAE public review consensus process helps to resolve many issues relative to implementing the energy efficiency standards subsequently based on ASHRAE. This may reduce both the volume of comments and the amount of changes required as a result of the comments, since the ASHRAE public review process has already provided an extensive forum. This factor may also apply somewhat to some standards outside of the US, as well. About 40% (6 of 15) of the responding jurisdictions outside the US have energy standards with strong roots in the ASHRAE standard. However, there probably are many other reasons for few comments and only minor changes suggested in our sample. These could be due to little or no effort undertaken to obtain comments, a short review period, disbelief that recommendations will be heeded, cultural bias against public critiques, skepticism that the standard would be enforced, or others.

Training workshops: these were reported as used by almost 90% of responding jurisdictions that have adopted energy standards. As shown in Figure 2, most of the training was provided to architects, engineers, and code officials. Some training was provided for equipment suppliers and owners and developers, but almost no training was provided for some other key building decision-makers, such as bankers, real-estate agents, contractors or builders. The typical amount of training varied from a half-day to a two-day workshop.

⁵ As this paper is being written, a second public review period is now underway for the current ASHRAE Standard 90.1. Extensive changes were made to the standard in response to some 18,000 comments from the first public review process.



Marketing/advertising: these were reported as used by about half of the responding jurisdictions. As Figure 3 shows, programs to advertise or market the energy efficiency standards also focused heavily on architects and engineers, like the training programs. Other key decision-makers were secondary audiences.

Also, six respondents listed what they thought where the most effective means to inform the building industry and the general public about an energy standard and its effectiveness. Their responses were:

- Workshops at association meetings
- Public seminars and workshops.
- Direct mail
- Circulars to professional bodies
- Newsletters (from a group that had started one the previous year).
- Demonstration projects.

5.4 Implementation Organizational Structure

In almost all cases, implementation oversight was provided by a government entity. A single exception was a jurisdiction in which implementation oversight was provided by a quasi-

government entity, i.e., a government established technical institute for buildings that was assigned that function.

In all cases, the organizational entity was pre-existing; it was not established specifically for implementing the energy standard. The primary responsibility of the implementing entity varied. In about half the cases, the primary responsibility of the entity was energy efficiency, while in the other half, the primary responsibility was building regulations.

Survey responses indicated that, in many cases, the energy code is adopted at the national, state, or provincial level of government, but is enforced at the local level as part of the building permit approval process. Government funding at the national and state levels typically supports overall management and administration at those levels, plus the costs of impact and revision studies. Costs for enforcement at the local level are typically covered via building permit fees.

5.5 Implementation Procedures

This section of the questionnaire inquired about what is being done to ensure compliance, what is checked when, and what compliance mechanisms are being used.

5.5.1 Measures to Ensure Compliance

Nine measures were examined as possible means of encouraging or ensuring compliance with the standards. The measures were:

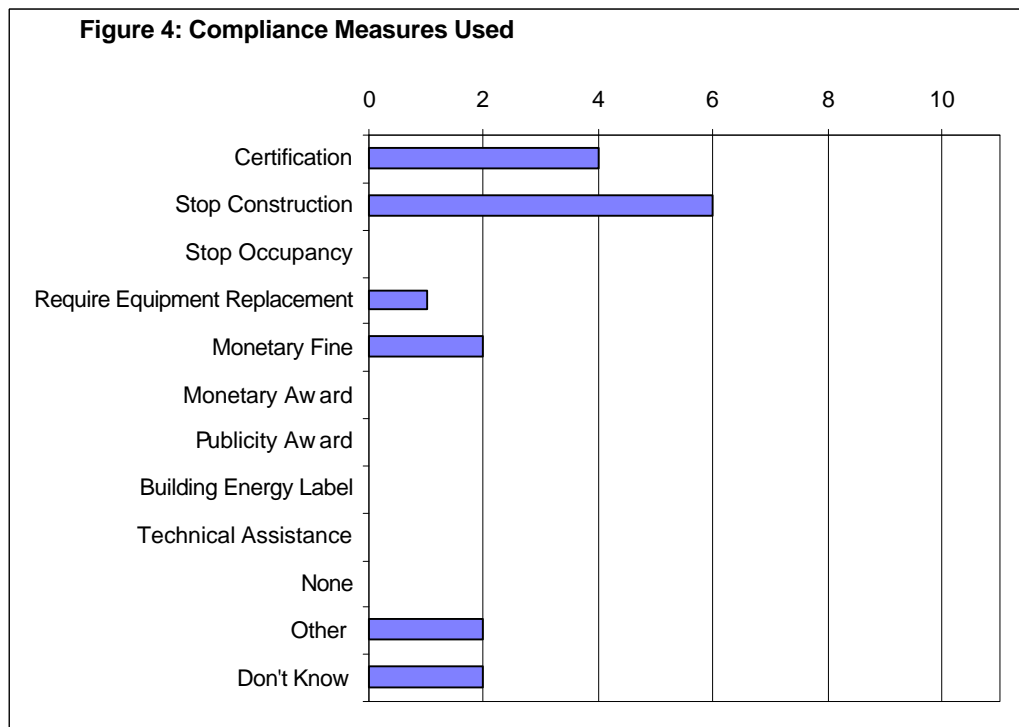
1. **Monetary award** for complying with or surpassing the standard.
2. **Publicity award** for complying with or surpassing the standard.
3. **Building energy label**, such as a plaque on the building that indicates that compliance has been achieved.
4. **Technical assistance** in completing the compliance process, or in checking compliance, such as by using a computer-based compliance tool
5. **Certification** by the architect, engineer, owner or other responsible person that compliance has been achieved.
6. **Stop construction**, if non-compliance has been determined, until it is corrected.
7. **Stop occupancy**, if non-compliance has been determined, until it is corrected.
8. **Require equipment replacement**, if equipment is determined to not comply with requirements of the energy standard (similar to #6 Stop construction, but more limited in application).
9. **Monetary fine**, if non-compliance is determined.

Only 4 of the 9 measures are reported as being used. As shown in Figure 4, these are:

- certification (4 responses)
- stopping construction (6 responses)
- requiring replacement of non-complying equipment (1 response)
- monetary fines (2 responses)

For those jurisdictions with mandatory compliance, the most widely used compliance measure was the legal ability to stop construction in the case of non-compliance. Construction could be started

again, once compliance is achieved. Information was not requested about the number of cases of non-complying buildings and the measures used in such cases (e.g., how many buildings had had construction halted, or equipment replaced, or fines levied).

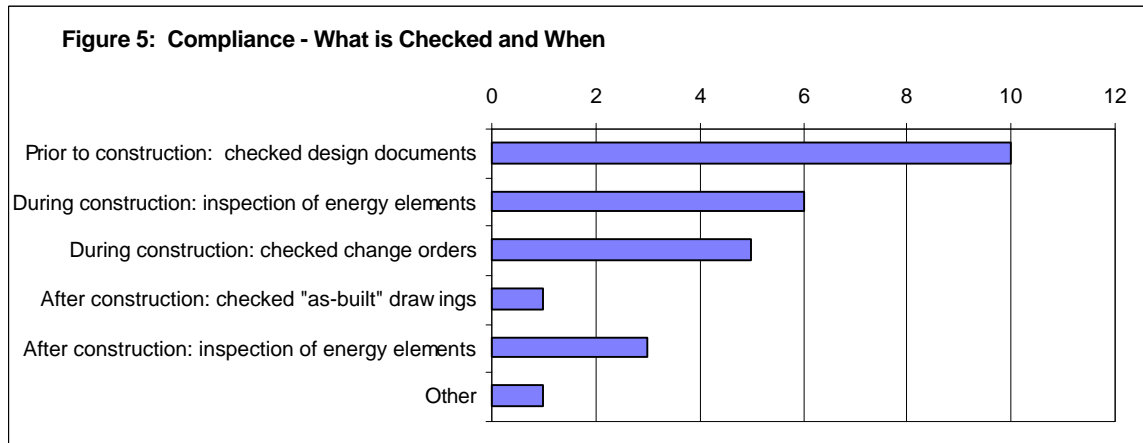


Several measures – monetary awards, publicity awards, building energy labels, and technical assistance – were not listed by any respondents as directly used as part of either voluntary or mandatory energy standard implementation programs. However, this does not mean that such measures are not being used. Rather, they were not reported as being *enforcement* measures for standards. They are often used as part of utility programs or other government programs that related indirectly to the energy standards. Such programs typically use the energy standard as a baseline, from which higher efficiencies are encouraged. There are numerous examples of this practice. For instance, in the US, the Environmental Protection Agency (US EPA) uses energy standards as baselines and requires a percent improvement beyond the energy standard for a building to qualify as an Energy Star building.

5.5.2 Checking Compliance – What is Checked and When

We investigated what procedures were used to determine compliance, and at which times compliance checks occurred during the design, construction, and occupancy process for a building. Building drawings could be checked before construction, during construction, and after construction. The energy elements of the building itself could be checked during construction and after construction. Figure 5 presents the results just for those jurisdictions that have adopted the energy standards on a mandatory basis.

Drawing check prior to construction most widely used: As Figure 5 shows, the most widely adopted method is to check compliance from construction documents prior to construction. Virtually all jurisdictions use this check.



Checks during construction also used: In addition, about half of the jurisdictions use checks during building construction. One means is to check change orders to ensure that they do not result in non-compliance. Another means is to check the energy elements of the building itself as construction is underway.

These compliance checks during construction are *potentially* very effective if they focus on two elements:

- ensuring that construction actually follows the energy-related intent of the design documents
- ensuring that change orders do not eliminate energy measures from the design documents that are needed for compliance. This is especially important, since cost pressures often result in change orders to reduce the cost of building systems; energy efficiency is often reduced in the process.

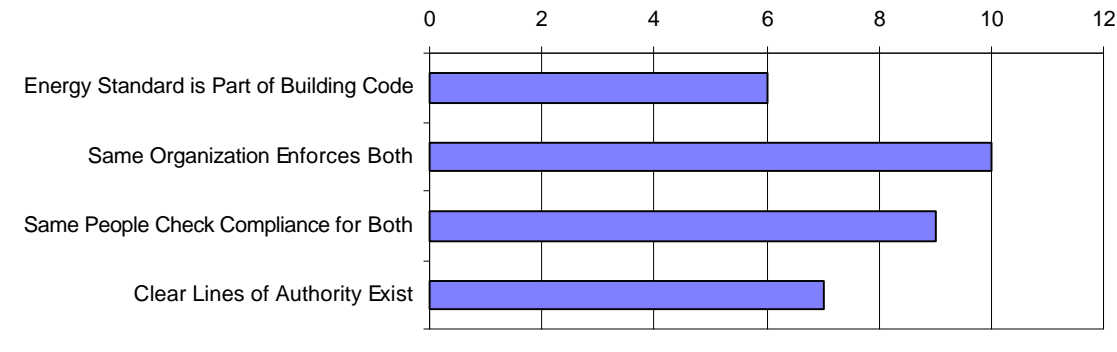
Checks after construction seldom used: only a few jurisdictions used compliance checks after construction is completed, either via checks of the final “as-built” drawings, or via inspection of the completely constructed building itself.

The infrequency of compliance checks at this point in the process represents lost compliance opportunities. This is especially true today, when the “commissioning” of buildings is increasing.

5.5.3 Compliance Mechanisms

As Figure 6 shows, the energy standard is part of the jurisdiction’s building code for about half of the responding jurisdictions. More predominant are the results about who does the compliance checking. In 90% of the jurisdictions, the same *organization* does enforcement for the building code and for the energy standard. In 80% of the jurisdictions, the same people do the compliance checking for both the building code and the energy standard. This means that the energy standard is treated procedurally as part of the building code, even when it is not officially part of the code.

Figure 6: Compliance Mechanisms



The positive aspect of this situation is that compliance with the energy standard is incorporated into an already established and staffed compliance process. There are several potentially negative aspects of this situation:

- A heavy training demand is placed on the system, to ensure that the persons accustomed to doing inspections from a life safety and health perspective become knowledgeable about energy compliance issues.
- The code inspectors may place less priority on the energy issues, which they may perceive as being less important than health and safety issues.
- If there are substantial problems with the existing building code compliance infrastructure (e.g., inadequate staff or resources, presence of graft, etc), then these problems also will impact compliance with the energy standard. The problem of graft can be especially vexing in some developing countries, where government staff salaries are very low.

5.6 Implementation Impacts

This section of the questionnaire asked questions about the effectiveness of the energy standards.

5.6.1 Effectiveness of Implementation

This question asked whether the implementation of the standard was “very effective,” “somewhat effective” or “ineffective.” For jurisdictions with mandatory compliance, there were 9 responses to this question as follows:

- 33% thought implementation was *very* effective
- 67% thought implementation was *somewhat* effective.

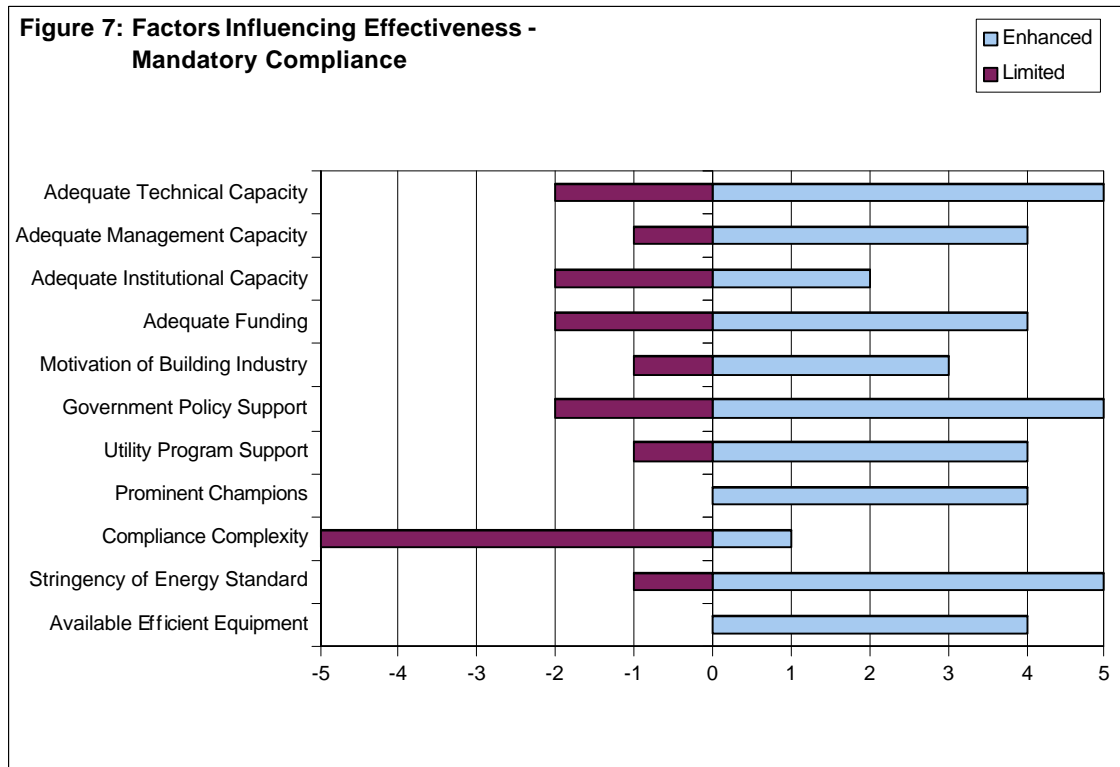
For jurisdictions with voluntary compliance, there were 5 responses as follows:

- 60% thought implementation was *somewhat* effective
- 40% thought implementation was *ineffective*.

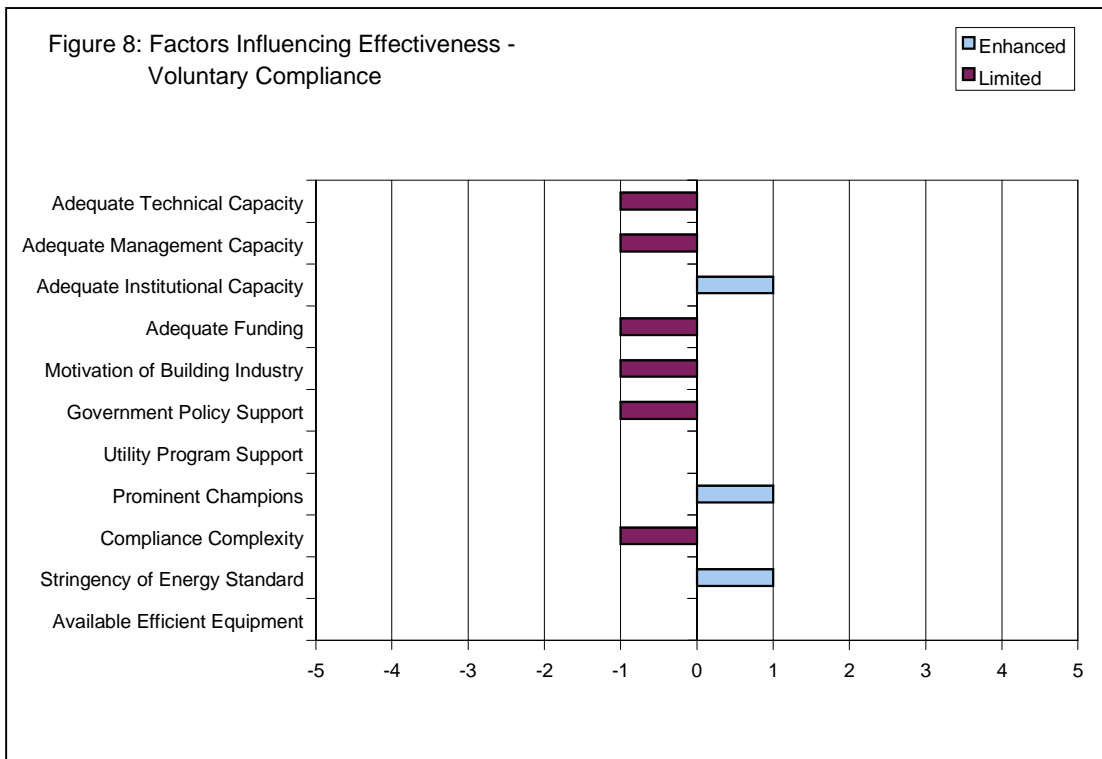
These results indicate a clear difference in perception about the effectiveness of implementing mandatory standards versus voluntary standards.

5.6.2 Factors Influencing Effectiveness

Respondents were asked to review a list of 11 factors. For each factor, they were asked to make a judgment as to whether the factor either *enhanced* or *limited* the effectiveness of implementation. The pattern of responses is quite different for jurisdictions with mandatory compliance versus jurisdictions with voluntary compliance. Many factors thought to enhance effectiveness in a mandatory context were thought to limit it in a voluntary context. These results are shown in Figures 7 and 8 for mandatory and voluntary compliance jurisdictions, respectively. Responses indicating a *limiting* effect are listed as negative numbers while responses indicating an *enhancing* effect are listed as positive numbers in the figures.

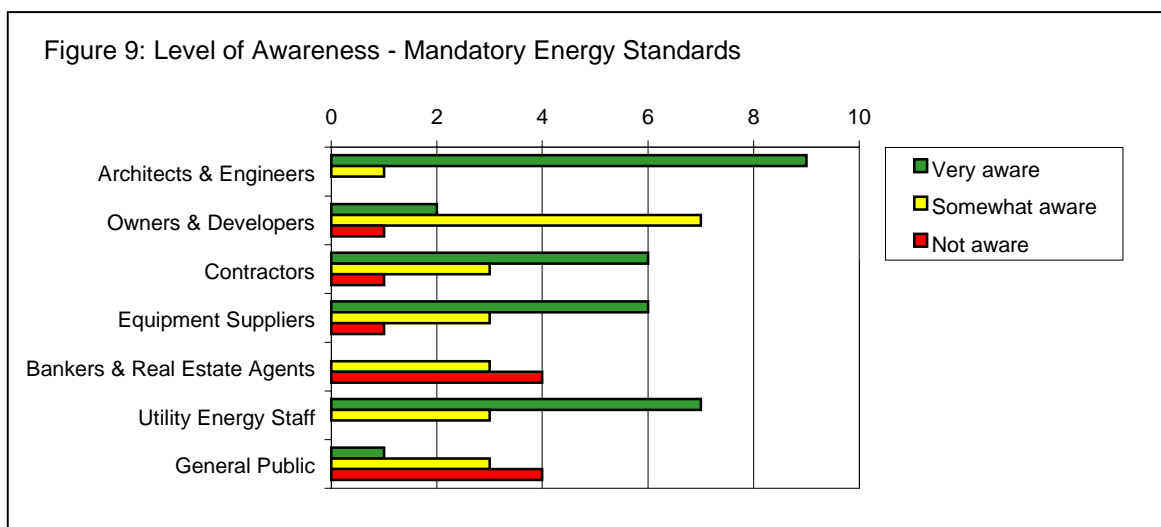


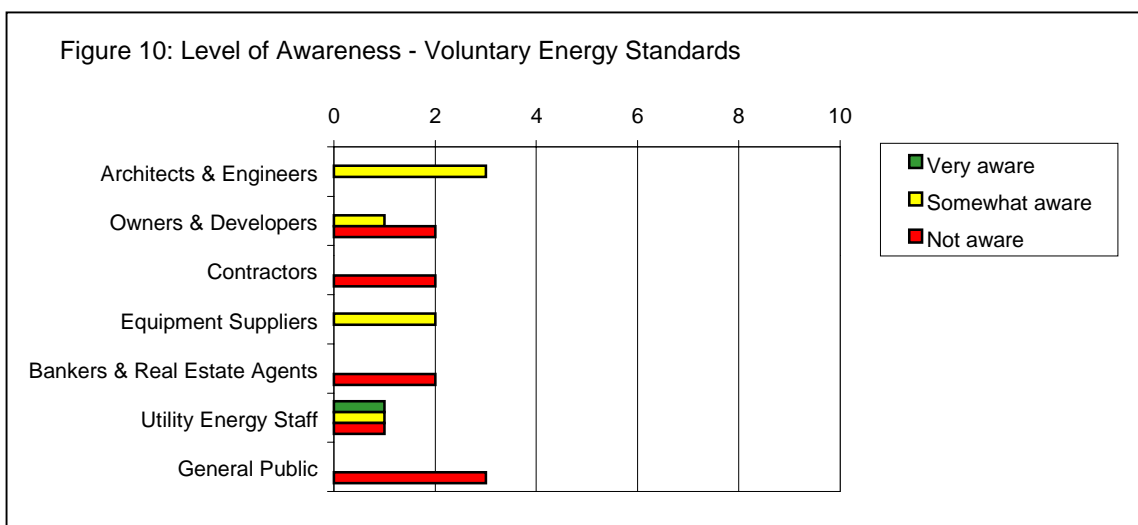
These results are very intriguing. For those jurisdictions with mandatory compliance, nearly all the factors are viewed as enhancing the effectiveness of the energy standards, but most particularly adequate technical capacity, government policy support, and stringency of the standard. The only strongly negative factor is “compliance complexity.” On the other hand, for those jurisdictions with voluntary compliance, nearly all the factors are perceived as limiting rather than enhancing implementation effectiveness, especially adequate technical and management capability, adequate funding, and government policy support.



5.6.3 Awareness of Energy Standards

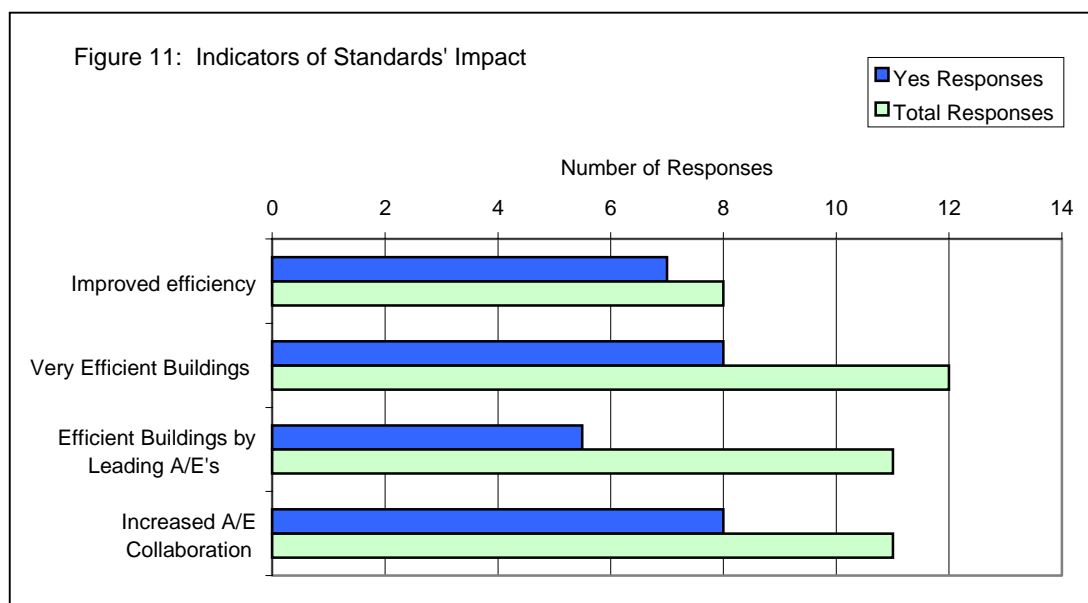
We sought an estimate of the level of awareness of the energy standard by different participants in the building industry. The responses indicate a much higher level of awareness for mandatory standards than for voluntary ones, as shown in Figures 9 and 10. For mandatory standards, most key building industry participants are reported to be either “very aware” or “somewhat aware” of the standard, the exception being bankers and real estate agents. In contrast, for voluntary standards, most building industry participants are reported to have a much lower level of general awareness, either “somewhat aware” or “not aware.” In neither case was the general public credited with a high level of awareness.





5.6.4 Other Indicators of Standards' Impact

In the absence of formal impact evaluations, indirect indicators can be used to infer whether standards have had an impact on energy use or the design process. Respondents were asked four questions about things that may have happened or changed since the standard was adopted, the inference being that the standard may have influenced them. For each question, Figure 11 lists the number of positive responses relative to the total number of responses.



The first question asked if they perceived an improvement in the energy efficiency of buildings since the implementation of the energy standard. Most of the respondents thought there had been some improvement⁶.

⁶ This question did not specifically ask respondents if they thought the energy standard contributed to the savings, how much the energy standard contributed, or what other factors might have been involved.

The second question asked if they knew of buildings designed and/or built since the energy standard was implemented, that were significantly more energy efficient than the levels required by the standard. Two-thirds of the respondents knew of such instances.

The third question asked if any leading architectural or engineering firms were designing buildings that either met or surpassed the level of energy efficiency required by the energy standard. Most reported that leading firms are designing to the standards or far surpassing them. Half of the responses report that leading firms are designing to the requirements of the energy standard; the other half report that leading firms are designing buildings that significantly surpass the requirements of the standard.

The fourth question asked whether there was evidence that communication or collaboration between architects and engineers had increased as a result of the standard. For mandatory standards, three-quarters answered affirmatively that they thought collaboration had increased.

5.7 Recommended Extensions to the Survey

This survey endeavored to (1) identify what implementation activities are being done internationally and (2) assess the general effectiveness of those implementation activities. It was not in the scope of this survey to conduct detailed analyses of specific implementation activities, or even to collect implementation documents from the jurisdictions surveyed. Survey results suggest that further study in key areas might be very fruitful, as indicated below.

5.7.1 Assess Estimates and Measurements of Energy Impacts and Cost Effectiveness of Standards

Many surveyed jurisdictions reported that they have done estimates and/or measurements of energy impacts and cost effectiveness of the energy standards. As is shown above in Figure 1, for jurisdictions that have adopted standards, about:

- 85% report having estimated future energy savings
- 65% report having estimated future cost effectiveness
- 55% report having measurements of actual energy savings
- 40% report having measurements of actual cost effectiveness

These are high levels of positive response to these questions. We anticipated that many jurisdictions would have estimates of projected impacts of the standards before they were implemented. However, we did not expect that about half of the jurisdictions would have measured impacts of standards post-implementation. A key question is how the predicted savings and cost-effectiveness compare with those actually achieved. Previous studies of predicted savings and cost-effectiveness of building energy standards can be summarized as follows.

- 15% to 30% energy savings for buildings that would comply with the standard as compared with typical current practice.
- 1 to 3 year simple payback time for the energy savings to pay for the increased construction costs of complying with the requirements of the energy standard.

A systematic survey and analysis of predicted versus actual saving for energy efficiency standards will provide very useful guidance to policy makers in the Philippines and elsewhere.

5.7.2 Identifying Innovative Approaches to Reducing Compliance Complexity

Compliance complexity was identified in the survey results as the factor that is most limiting to effective compliance. Our survey did not address in detail the level of complexity of the various energy standards. Assessing compliance complexity would involve developing some indices for comparing different standards, for example:

- Number of compliance paths (more paths actually implies greater simplicity, where the simplest compliance path for each building can be selected)
- Total number of requirements for each building system and/or compliance path
- Number of calculations required (e.g., Overall Thermal Transfer Value (OTTV) calculations)
- Amount of time required to acquire or restructure building data specifically for compliance (e.g., calculation of window-to-wall ratio for each orientation)
- Existence of simplified compliance for small and/or simple buildings
- Existence (and some measure of effectiveness) of manuals or computer-based tools that do calculations for the user
- Availability of technical assistance in proving compliance

The survey also did not attempt to identify any innovative approaches or techniques aimed at *reducing* the complexity of compliance. Such innovative approaches could involve the compliance procedures, and/or the format and content of the standards.

The implication is that if complexity is reduced, then compliance will improve and so will energy savings. Given the importance of this potential, we strongly recommend that further survey and analysis efforts be done first to assess the complexity levels of current standards, and second, and more importantly, to identify innovative approaches for reducing compliance complexity. This information should prove very useful both to policy makers and to the implementers of standards.

5.7.3 Further Analyze the Effectiveness of Enforcement

We are struck by the importance of adopting a standard as mandatory rather than as voluntary. A mandatory standard, in turn, can be effective only if it is properly enforced.

In the survey we examined the legal capabilities for enforcement. Many of the jurisdictions with mandatory compliance also have legal authority to impose penalties in the case of non-compliance. However, the survey did not ask how many times that legal enforcement occurred or how many times penalties were invoked. Given the importance given to mandatory enforcement by many survey respondents, the extent of actual enforcement is important. For example, it would be useful to ask how often one or more of the following events has occurred:

- Building designs have been cited or returned for corrections because of non-compliance with the energy standard
- Code approvals have been delayed or halted while building has been brought into compliance with the requirements energy standard, either because of non-approval of design documents, or because of non-approval from construction inspection or change order review
- Penalties have been invoked on designer and/or owner because of non-compliance

To provide a proper context for the analysis, the number of occurrences of the above enforcement actions should be related to the number of buildings designed and built. However, in a given jurisdiction it does not take many incidences of the above actions for building designers and owners to “get the message” that enforcement is happening. Construction delays and changes can be very expensive, and most building owners and contractors will be quite responsive to such signals. Invoking penalties, or delaying construction on even a very small proportion of buildings constructed would be highly effective as a deterrent, for the incremental cost of compliance is quite small compared with the high costs of major delays in construction or of changing non-complying equipment during construction. Conversely, if enforcement actions never or rarely occur, then designers and owners get the message that the standard is ignorable.

6 Recommendations on Implementing Standards

The following conclusions and recommendations, drawn from survey results and experience, address issues that are germane not only to the Philippines, but also more broadly to other countries and jurisdictions developing or implementing energy standards for buildings.

6.1 Adopt as Mandatory

The survey results indicate that mandatory adoption is important to the success of an energy standard. In 3 of the 4 jurisdictions that have voluntary compliance with the energy standard, the energy standard is essentially ignored. Respondents from one jurisdiction with voluntary implementation stated this opinion directly. In another jurisdiction, voluntary adoption is reportedly being treated simply as an interim condition, and the standard is intended to become mandatory as soon as possible. Of all the jurisdictions surveyed, the only indications that implementation is ineffective came from jurisdictions with voluntary adoption. The implication here is that the mandatory adoption of an energy standard is essential for it to be taken seriously.

6.2 Clearly Define Roles, Responsibilities, and Authority

Survey responses and other experiences of the authors show there should be clearly defined roles, responsibilities, and unequivocal authority given to one or more organizations to carry out implementation activities for the building energy standard. There is no one best model for how to structure various implementation roles and responsibilities; it depends on the circumstances particular to each jurisdiction. No entity should be assigned responsibility without being given the commensurate authority to effectively carry it out. However, a common theme emerges from the survey in which three primary roles of compliance are carried out by different entities: administrative oversight, enforcement, and standard development and revision. Typically the administrative oversight function is carried out at a national or regional level by an organization whose charter is buildings or energy efficiency. The enforcement function is often carried at a local level by building code officials already responsible for health and life-safety. The standard evaluation and revision function is typically carried out at the national level. It is not necessary, or necessarily even desirable, that the entity that implements the standard would be the same entity that developed the standard, or that would evaluate implementation results or would manage the effort to revise the standard. No matter how the roles are divided, the best successes occur when each of the entities are active in conducting their own roles in close coordination with the others, working towards achieving common objectives.

6.3 Enforcement is Key

Experience shows that it is not enough to pass a law concerning an energy standard and to assign an agency to oversee implementation. The organization charged with responsibility for compliance needs to demonstrate its serious intent to enforce the standard. Enforcement in this context is generally synonymous with exercising authority to impose penalties for non-compliance. The following types of penalties are typical and particularly effective:

- stop construction
- withhold an occupancy permit
- levy a monetary fine

Enforcement needs to be demonstrated, for at least some buildings, both before and after construction. If buildings designs and constructed buildings are found to not be in compliance, then they must be cited and required to comply or respect for the mandate will be lost.

Experience also shows the benefit of adopting specific measures to encourage and to track compliance enforcement. One approach used is to require detailed compliance reviews for at least 10% of the floor area constructed or 10% of the buildings constructed (whichever is larger). Another approach is to publicly document enforcement results. These compliance reviews would be published in the public record periodically, along with a record of the actions taken on specific building projects in the case of non-compliance.

Several enforcement approaches encourage compliance using positive incentives. The following incentives for compliance may prove beneficial:

- monetary awards for surpassing compliance by some amount.
- public notification award for surpassing compliance by some amount
- award of Labels of Achievement to Buildings
- subsidized technical assistance

Providing incentives for complying with the energy standard, and for surpassing the standard by 10% to 30%, are programs that are widely used in conjunction with energy standards. Normally, such programs have been part of electric utility incentive and rebate programs, but some programs such as the US EPA “Energy Star Building” award and labeling program, have been accomplished by government agencies.

Penalties and incentives used in combination can be especially effective, with penalties used to ensure compliance with the minimum requirements of the energy standard, and, at the same time, incentives used to encourage the design and construction to go beyond those requirements.

6.4 Develop a Transparent and Easy-to-Follow Compliance Process

Survey respondents reported strongly and consistently that complexity in the compliance process has a very negative impact and should be avoided. It is best to develop and disseminate a set of compliance procedures, forms, manuals, and tools that clearly describe what compliance documents are to be submitted, by whom, to whom, and when. Including substantial participation by members of the building industry that will ultimately need to use the products – including architects, engineers, building owners, developers, manufacturers, and contractors – will help ensure that the compliance process is kept simple, and that the products are clear and easy to use. In prescriptive form, this experience can be stated as follows:

- Compliance procedures should be clearly defined in detail. They should be as simple as possible and segregated by size of building, with the smallest buildings having the simplest procedures.
- Compliance procedures and forms should be fully explained and documented in compliance manuals.
- All compliance procedures, forms and manuals should be field tested on one or more real buildings under design of different sizes and types (e.g., office, retail, hotel). Members of the group setting compliance policies should be involved in the field tests.

This can best be achieved if the standard itself is easy to understand. Simplifying compliance with a complicated standard may be an exercise in futility. Ideally the building energy standard is conceived and developed with the compliance process in mind. ASHRAE's Standard 90.1, for example, has included several potential alternate compliance paths that trade off compliance complexity and flexibility. This approach appears to be at least partially successful in reducing complexity. On the other hand, adequate field testing of compliance complexity by the persons developing the standards rarely seems to occur, despite the fact that it is generally considered to be highly beneficial.

6.5 Establish Ongoing Process of Evaluation and Revision

After implementation of the energy standard is accomplished, a review and revision cycle is needed. The survey results show the presence of an ongoing revision process, with revisions occurring every several years, to be a consistent characteristic of "mature" energy standards programs.

Such a routine revision cycle presents a regular opportunity to simplify and harmonize the standard and its compliance process. It also allows for regular increases in the standard's stringency to keep up with technology and building industry market trends. Both the standard and its implementation benefit from routine review, evaluation and revision as appropriate. In order that the agency with compliance oversight is not evaluating itself, an independent entity is needed for the evaluation task.

Effective evaluation processes include at least selective monitoring of the following impacts of the energy standard: energy impacts, energy cost impacts, construction cost impacts, and cost-effectiveness. The cost-effectiveness analysis is best conducted from both a societal economic perspective and a private building owner financial perspective.

Another potential subject for evaluative review is the assessment of the overall administrative cost of complying with and enforcing compliance with the energy standard. This would include estimates of the time and cost of building owners and designers for complying with the requirements, plus the cost to various entities administering the program and enforcing the standard. These costs would be factored into an overall assessment of cost-effectiveness of the standard to the jurisdiction involved. These costs would not be consistently available until the implementation has been underway for some period of time.

Survey results identified stringency as a key implementation issue, and 3 out of 4 survey responses indicate that stringency enhances implementation effectiveness. No matter how effective the

implementation program is, if the building energy standard is weak, it will not save energy and will be perceived as ineffective and a waste of time and money.

Stringency levels are most effective and respected when they are based, insofar as possible, on cost effectiveness analysis, balancing the national economic perspective and the financial perspective of the building owner. From experience of some jurisdictions going through the revision process, stringency of the standard could substantially increase over its existing level when based on cost-effectiveness. However, stringency levels may need to be tempered by consideration of several potent barriers to substantial increases in building energy efficiency including: availability of energy efficient products in the marketplace; the desire to maintain the competitiveness of in-country manufacturers; and, the current levels of energy efficiency skill and knowledge by in-country design professionals.

6.6 Make a Government Commitment

Effective leadership is important to successful implementation. Our survey indicates government policy support as a key success factor in implementing standards. For a standard to be effective, government must show its commitment by assigning a capable, motivated, and sufficiently senior person to oversee the implementation program. It should also demonstrate commitment to the policy by earmarking budget and staff to carry out the program. Fees for energy standard permits established and charged to building developers are effective in helping cover building-by-building enforcement costs and enhancing the image of the importance of the program. Such fees might be higher than required just to cover local enforcement costs in order to generate additional revenue directed to help support the cost of the overall program administration at the national or state / provincial levels. This approach may be an effective way of providing program stability by assuring adequate funds to provide implementation services when government budgets are tight.

6.7 Train and Inform Stakeholders

Training is a key component of successful implementation of all energy standards. This is particularly true for standards imposed on the typically decentralized buildings industry. Our survey showed that the most common factor limiting the effective implementation of building standards is insufficient technical and management training. Most jurisdictions understand the need to train those stakeholders most directly affected by the standard -- designers and code officials -- and they provide training programs for them. Advertising /marketing programs for energy standards have also had the same general focus on designers and code officials.

Less prevalent are training or advertising /marketing programs geared towards other key decision-makers: equipment suppliers, owners and developers, bankers, real estate agents, and builders/contractors. Yet, each of these stakeholder groups make decisions in their daily roles that can influence a building's compliance with the standard specifically, or energy efficiency generally, either negatively or positively. At a minimum, advertising or information programs are helpful in informing each of these stakeholder groups about the benefits of the energy standards. The most effective information programs emphasize how changes in the decisions of each of these stakeholder groups can positively improve energy efficiency and cost effectiveness of buildings, which in turn can benefit the decision maker and the country as a whole. In addition, specific training programs for those stakeholders can further shift those decisions in positive directions.

6.8 Encourage Participation and Support of Building Industry Suppliers

In other countries, building industry suppliers have provided valuable input to the development and revision of energy standards. Suppliers are intimately familiar with the levels of energy efficiency of products available and being purchased in the marketplace. They also have a very good understanding of what will and will not work in the marketplace. Suppliers often favor energy standards, since energy efficiency standards encourage the use of usually more expensive and profitable, products. Suppliers can help accelerate the pace of implementation or, at least, not act as an impediment.

A key issue to address is how to get balanced input for each major type of building equipment and not to give advantage to one company over others via their participation as part of a standard setting or implementing process. One way is to have key people participate via membership in relevant trade associations. Another way is to invite participation of at least 2 key representatives from each sector - lighting, glazing, air-conditioning. If this is done, some effort should be made to balance interests of large international firms and domestic firms.

6.9 Consider Standards in Context with Related Energy Policies

This paper deals with issues of the proper implementation of energy efficiency standards. While this is an important subject that has often been overlooked, it is just one policy among several that can address the goal of significantly improving energy efficiency in commercial buildings.

Energy efficiency standards set minimum requirements for energy materials and equipment that fall far short of economically optimum levels. Standards are typically designed to capture only a small proportion of available cost effective energy savings. That leaves much of cost effective energy savings unrealized. For this reason, governments often use energy standards in conjunction with other policies and programs that together are intended to capture much of the achievable energy savings potential. Three policies applied in combination have proven especially effective:

1. Mandatory energy standards that set minimum requirements for the 5 to 10 most important energy efficiency measures for the types of buildings and climates involved.
2. Investment incentives (e.g. loans, rebates) to encourage additional energy savings beyond the standard.
3. Market transformation actions to increase the presence of energy efficiency of products offered in the marketplace, including such items as manufacturer incentives and equipment testing and labeling.

Each of these policies by themselves will have a positive impact. But implemented together, they reinforce each other. Each of the three policies addresses the same primary barriers to energy efficiency: (1) insufficient awareness; (2) first-cost bias; and (3) indifference. However, each of the three policies addresses different primary audiences. Standards primarily address building designers (architects/engineers), and also somewhat address contractors, distributors and manufacturers. Investment incentives primarily address building owners, developers, bankers and lenders. Market transformation actions primarily address manufacturers and distributors of building equipment and materials. Decision-making processes in each of the above target groups need to change for substantial energy efficiency improvement to occur in commercial buildings.

Investment incentive programs are sometimes conceived in conjunction with standards programs, and there are numerous examples of this in the US and elsewhere (Nadel, 1992). Typically the requirements of the mandatory standard are used as a baseline, and investment incentives are provided to finance the increased incremental design and/or construction cost for energy efficiency measures. In addition to the financial component, such programs sometimes include a training and/or a capacity-building component, and a monitoring and/or verification component of the savings.

A synergistic aspect of investment incentive programs is that they prepare the way for the next generation of energy standards. The typical successful energy standard program updates the requirements of the standard “every few years.” In practice, this might result in a revision every 3 to 7 years. Because the incentive programs are capturing energy savings beyond the standard currently in place, the incentive programs are bringing more efficient products and techniques into the marketplace. This trend allows the requirements of each new generation of energy standard to be progressively more stringent.

Well-proven, off-the-shelf energy efficient equipment must actually be present in the market at reasonable prices. This is the case for most developed countries, but is often not the case for developing countries. The lack of such equipment in local markets can be from any one or combination of factors: lack of demand, perception of low market potential and/or low profit potential by distributors, lack of local manufacturing experience or expertise, lack of local experience with the products, high levels of import duties to protect local industries without encouraging development of those industries.

The approach needed is to identify what is missing in the local marketplace, and why. Once the deficiencies are identified, then specific programs and measures can be developed to correct the situation. Such measures might include:

- Reducing the level of import duties and other taxes on designated high-efficiency equipment and components
- Encouraging the local assembly or manufacture of high efficiency equipment and systems via joint-ventures with foreign manufacturers or licensing or other arrangements
- Design and construction of demonstration buildings that incorporate these technologies, so that local distributors and contractors gain experience with their use on a low-risk basis
- Encouraging local manufacturers and distributors to participate on technical review committees concerning energy standards, including participation in the setting of local requirements
- Providing financial and/or technical assistance to local manufacturers during cycles of retooling that would result in improved product energy efficiency over time. Each cycle might eliminate the least efficient products, while assuring that companies are not unfairly forced out of business

7 Possible Path to Implementation in The Philippines

The Philippine Government faces the challenge of designing a compliance mechanism for its commercial building energy standard. As mentioned previously, the standard is not yet enforced. There are no compliance procedures, and responsibilities have not yet been agreed upon among the three agencies involved. The release of the study characterizing the commercial building construction and permitting process in the Philippines has stimulated the reconvening of the Building Advisory Committee that served as advisor to the Government of the Philippines in the adoption of the building code in 1994. The Committee, at its first meeting since the code became law, reached strong consensus on a collaborative compliance process among DPWH, DILG and DOE. The recommended process would have DILG responsible for the processing of building permits, inspection of plans and construction, and enforcement of compliance. DOE would be responsible for monitoring compliance of the code, evaluating the effectiveness of the code, and recommending technical updates in the code to DPWH. DPWH would be responsible for updating the code from time to time. Discussions on this scheme have begun at the Undersecretary level among the three Ministries.

What role each of the three Ministries might agree upon and what resources each might devote to energy performance compliance has yet to be determined. The situation is complicated by the fact that new Ministers were appointed in all three of the agencies responsible for code compliance as a result of recent national elections. This causes great uncertainty now about how a compliance plan might turn out.

Furthermore, there are additional complexities. For example, it is unclear whether new local ordinances will be required to modify existing building code permitting processes to add energy performance permitting. One opinion is that there is a good possibility that this can be achieved by the national government, but legal research is required before such an approach could be initiated. And the political acceptability of such an endeavor is even more unclear. Another complication in the design of the compliance mechanism is the expectation that adding energy performance permitting to the existing building code permitting process is unlikely to achieve high compliance. One thought is that the educational process for all stakeholders in the building trade accompanying such an approach, coupled with at least some level of compliance, is enough to expect and well worth the cost. Another thought is that an alternative compliance approach should be found. Meralco, the local electricity distribution company for Metropolitan Manila, has informally raised the suggestion that it could effectively manage the compliance process using electrical hookup disapproval as a potential sanction.

When the time comes to develop compliance tools, additional market characterization and detailed technical analyses of compliance cost and effectiveness will be needed. In the meantime, it is political considerations that are likely to govern the selection of an approach to energy performance standard compliance.

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10 Appendix: Questionnaire

Implementation of Standards for Energy Efficiency in Commercial Buildings

For Country: _____

The focus of this survey is on the **implementation** of energy efficiency standards for **commercial** buildings. From the information gathered, we hope to gain more clarity about those factors that contribute to successful implementation. Our intent is to widely distribute the information from this survey in order to assist interested persons in various localities to more effectively implement energy standards.

Note: The following terms are defined on the last page of this questionnaire: standard, implementation, compliance, guideline, commercial.

Section 1: Overview

1. **Regulations and Standards for Buildings:**

Does your country have building regulations, standards or codes of any kind (e.g., health, structural safety, fire prevention, etc.)? Does it also have standards for energy efficiency in buildings?

	Building codes or standards for health and life safety	Energy Efficiency Standards for Buildings
a) Being developed	<input type="checkbox"/>	<input type="checkbox"/>
b) Being implemented	<input type="checkbox"/>	<input type="checkbox"/>
c) Adopted, voluntary	<input type="checkbox"/> If yes when? _____	<input type="checkbox"/> If yes when? _____
d) Adopted, mandatory	<input type="checkbox"/> If yes when? _____	<input type="checkbox"/> If yes when? _____
e) None	<input type="checkbox"/>	<input type="checkbox"/>
f) Don't know	<input type="checkbox"/>	<input type="checkbox"/>

2. Are there any special circumstances about building standards in your country/ region/ locality? For example, are they implemented only at the national level, or is there separate implementation by region, state, province, or major city? Do the energy efficiency standards apply to just one or two building systems, such as lighting or space conditioning, and not to others, such as the building envelope?

If standards exist, or are being implemented, please complete the rest of the questionnaire.

If more than one standard exists, please choose one standard and answer all remaining questions relative to that standard! Give name of standard and applicable locality:

If building standards for energy efficiency in commercial buildings are NOT IN PLACE, for either voluntary or mandatory compliance, or standards are NOT BEING IMPLEMENTED at any level, then please STOP

HERE. Place your name and coordinates on page 9 of the questionnaire, and return just this page and page 9 via fax.

Section 2: Implementation Activities

A number of activities often are undertaken in implementing energy efficiency standards for commercial buildings. Please indicate below if any of these activities have occurred or if materials have been developed.

Part A: Overview Questions

	Yes	No	Don't know
7. Compliance Procedures: have been developed and distributed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Compliance Manuals: have been developed and published.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Compliance Forms: have been developed and published.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Field testing: compliance forms and/or procedures have been tested on some buildings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Training workshops: have been held	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Estimated Building Impacts:			
a) Energy Savings: have been estimated through calculation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Cost Effectiveness: has been estimated based on engineering economic calculations, professional judgment or other methods.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Measured Building Impacts:			
a) Energy Savings: have been calculated through measurement of actual buildings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Cost Effectiveness: has been calculated through measured savings achieved and actual costs incurred.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Public review process: is under way or has been completed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Marketing, advertising: or other promotional efforts have occurred to increase awareness of the standard.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Revision Update Process for standard:			
Is planned <input type="checkbox"/>			
Has been scheduled <input type="checkbox"/>			
Has been completed <input type="checkbox"/>			
No plans <input type="checkbox"/>			
Don't know <input type="checkbox"/>			
If revision is planned, scheduled, underway, or completed, which generation of the standard will result or has already resulted (second, third, fourth, etc.) _____.			

Part B: More Detailed Questions on Selected Implementation Activities

1. *Formal Training:*

If training courses or workshops been given to provide information about the energy codes or standards, please provide information about those courses.

Courses or workshops were held for:	Yes	No	Don't Know	If "Yes", then provide details if known		
				Number of courses	Number of persons trained	Days of training per person
a) Architects and Engineers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
b) Equipment suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
c) Code officials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
d) Owners and developers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
e) Bankers and real estate agents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____

2. *IF a Public Review Process has occurred for the standard:*

a) *About how many responses were received?*

10 or less <input type="checkbox"/>	11-50 <input type="checkbox"/>	51-100 <input type="checkbox"/>	100+ <input type="checkbox"/>	Don't know <input type="checkbox"/>	Actual number, if known _____
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b) *How extensive were the revisions to the standard as a result of the responses?*

Major revisions <input type="checkbox"/>	Modest revisions <input type="checkbox"/>	No revisions <input type="checkbox"/>	Don't know <input type="checkbox"/>
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3. *Marketing, advertising, or other promotion of standard:*

If specific marketing and/or advertising activities have been done to increase awareness of the commercial standard, please indicate below the target audiences and your judgment of the effectiveness of the activities.

Marketing or advertising program to increase awareness of:	Yes	No	Don't Know	If "Yes," please estimate how effective		
				Very Effective	Somewhat Effective	Not Effective
a) Architects and engineers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Equipment suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Code officials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Owners and developers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Bankers and real estate agents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

From your experience, what are the most effective means to inform the building industry and the public about the existence of an energy standard and its effectiveness? How can these activities be effectively applied locally?

Section 3: Implementation Organizational Structure

1. *Type of organizational unit responsible for compliance with the energy standard:*

Oversight of compliance with the standard is located in the:

- | | |
|--|--------------------------|
| a) Government | <input type="checkbox"/> |
| b) Quasi-government (e.g., organization created by and funded by the government) | <input type="checkbox"/> |
| c) Private sector (e.g., professional society, business group) | <input type="checkbox"/> |
| d) No organization is responsible for compliance | <input type="checkbox"/> |
| e) Don't know | <input type="checkbox"/> |

Please give name or organization and discuss any special circumstances _____

1. *If government or quasi-government, what is primary responsibility of the compliance organizational unit:*

If the organizational unit overseeing compliance is government or quasi-government, then indicate the primary responsibility of the government agency.

Responsible for energy efficiency	Responsible for buildings	Other (please specify)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. *If in the private sector, what is the primary function of the compliance organizational unit:*

What is the primary type of organization

Utility	Non-government organization (NGO)	Professional society	Other (specify)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. *Primary Mission of the organizational unit overseeing compliance:*

Was this organizational unit pre-existing, or was the unit created specifically to implement the energy efficiency standard?

Pre-existing	Newly-created
<input type="checkbox"/>	<input type="checkbox"/>

4. *Staffing:*

Indicate the number of persons within the above-identified organizational unit who are actively involved in implementing the energy efficiency standard for commercial buildings. This includes promotion, training, enforcement, monitoring, evaluation, etc.

_____ number of full-time persons
_____ number of part-time persons

5. *Other Staffing:*

Please list and describe the organizations where such people are located _____

If applicable, indicate the number of persons *outside* of the organizational unit who are actively involved in implementing the energy efficiency standard for Commercial buildings, including promotion, training, enforcement, monitoring, evaluation, etc.

_____ number of full-time persons
_____ number of part-time persons

6. *Budget:*

Estimate the approximate annual budget for all implementation activities. _____ Monetary Units _____
or Don't know ☐

7. *Funding:*

has been provided from which sources? _____

Section 4: Implementation Procedures

1. Number of Buildings:

Indicate the number of buildings

that have gone through the compliance procedure:

	10 or less	11-50	51-100	100+	Don't know
a) since standard was implemented, and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) in a recent year only _____(year).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Approximately how many commercial buildings are constructed each year, if known? _____					

1. How is compliance ensured or encouraged? (check all that apply)

Incentive:

Monetary award	<input type="checkbox"/>
Public award	<input type="checkbox"/>
Label of achievement (e.g., energy star)	<input type="checkbox"/>
Subsidized technical assistance	<input type="checkbox"/>

Penalty:

Stop or delay construction	<input type="checkbox"/>
Stop or delay occupancy of building	<input type="checkbox"/>
Requires replacing equipment/ materials	<input type="checkbox"/>
Monetary fine	<input type="checkbox"/>

Certification by designer, contractor, owner ☐

Other (specify) _____ ☐

No mechanisms ☐

Don't know ☐

2. Compliance - what is checked and when?

	Yes	No	Don't know
Prior to construction: Check of design documents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
During construction: Check of building energy elements via inspections.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check of "change orders" that modify design documents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
After construction: Check of "as-built" drawings or change orders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check of building energy elements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: Checks unrelated to timing of construction (please explain).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Compliance Mechanisms:

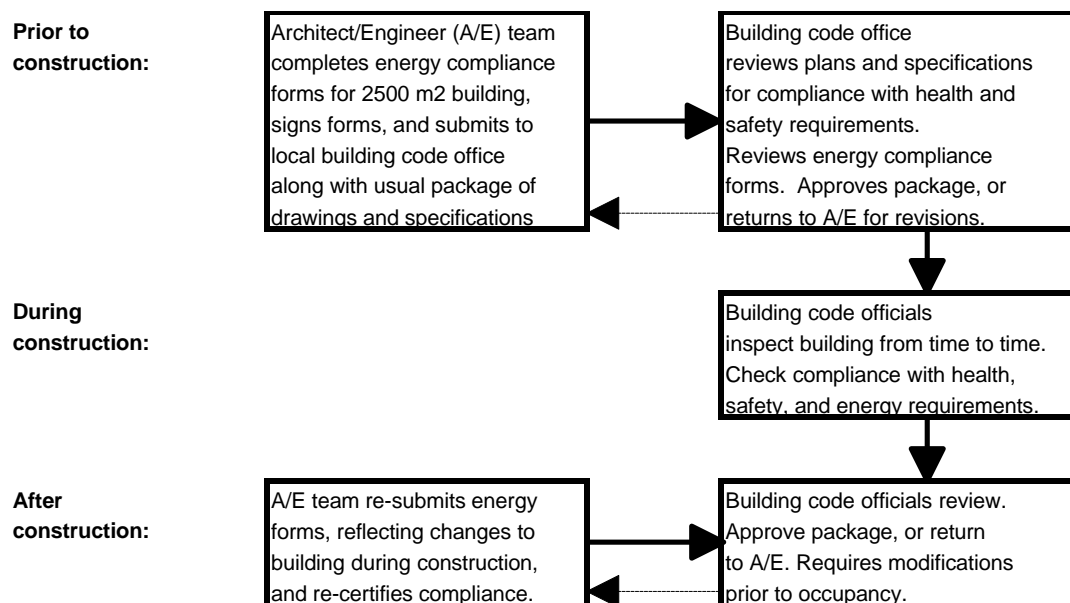
Is the standard part of the health and safety building codes or is it separate? Please answer the following options as appropriate:

a) The energy standard is included as of the building code.	Yes	No	Don't know
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Enforcement of the energy standard and the building code is by same organization.	Yes	No	Don't know
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) The same people check compliance with the energy standard and the building code.	Yes	No	Don't know
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) There are clear lines of authority relative to compliance and enforcement of the energy standard.	Yes	No	Don't know
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Comments? _____			

5. Compliance Process:

Draw your own diagram of the process as you understand it, or write a brief description of the process in the space below. For illustration purposes an example diagram is shown at the bottom of the page.

Illustrative Compliance Diagram



Section 5: Implementation Impact

1. *Effectiveness of Implementation:*

In your opinion, how effectively has the standard been implemented?

Very effective

☐

Somewhat effective

☐

Ineffective

☐

Don't know

☐

Please explain why it is effective or not effective.

2. *Factors enhancing or limiting effectiveness:*

In your opinion, which factors have enhanced or limited the effectiveness of implementation?

	Enhanced the effectiveness	Limited the effectiveness
a) Adequate <i>technical</i> capacity	<input type="checkbox"/>	<input type="checkbox"/>
b) Adequate <i>management</i> capacity	<input type="checkbox"/>	<input type="checkbox"/>
c) Adequate <i>institutional</i> capacity	<input type="checkbox"/>	<input type="checkbox"/>
d) Adequate funding	<input type="checkbox"/>	<input type="checkbox"/>
e) Motivation by building industry	<input type="checkbox"/>	<input type="checkbox"/>
f) Policy support by government	<input type="checkbox"/>	<input type="checkbox"/>
g) Program support by utilities	<input type="checkbox"/>	<input type="checkbox"/>
h) Presence of prominent <i>advocates</i> or <i>champions</i>	<input type="checkbox"/>	<input type="checkbox"/>
i) <i>Complexity of complying</i> with standard	<input type="checkbox"/>	<input type="checkbox"/>
j) <i>Stringency</i> of standard	<input type="checkbox"/>	<input type="checkbox"/>
k) Adequate <i>availability</i> of efficient equipment	<input type="checkbox"/>	<input type="checkbox"/>

1. *Improvement in Efficiency:*

Since the standard has been implemented, have you observed an improvement in the energy efficiency of buildings being designed and constructed:

a) In your country

Yes ☐

No ☐

Don't know ☐

b) In your region

Yes ☐

No ☐

Don't know ☐

c) In your locality

Yes ☐

No ☐

Don't know ☐

If "Yes," please describe which building systems (lighting, building envelope, HVAC, etc.) have improved in efficiency, and describe briefly what improvements have occurred.

1. *Very Efficient Buildings:*

Since the code was implemented, do you know of any buildings that have been designed and/or built that are significantly more energy efficient than the levels required in the energy code or standard?

Yes ☐ No ☐ Don't know ☐ If "Yes," about how many very efficient buildings? _____

If "Yes," indicate approximately how much more efficient than code: _____ (list if % or other units)

2. *Awareness of Standard and its Requirements:*

To your knowledge, what is the extent of awareness by the following groups of the energy efficiency standard.

	Very Aware	Somewhat Aware	Not Aware	Don't Know
a) Architects and Engineers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Owners and developers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Contractors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Equipment suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Bankers and real estate agents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Utility energy efficiency staff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) General public	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. *Use by leading or most prestigious architecture and engineering firms:*

To your knowledge, are *any* of the most prestigious local architecture and engineering firms designing buildings that meet a voluntary standard or are much more energy efficient than a mandatory standard.

	Designing to standard	Designing much more efficient than standard	Don't know
a) Leading or prestigious architects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Leading or prestigious engineers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. *Collaboration:*

In your opinion, is there evidence of increased communication or collaboration between architects and engineers during the building design process as a result of the standard?

Yes ☐ No ☐ Don't know ☐

If "Yes," please describe. _____

8. *Standard as Benchmark or Baseline:*

Do you know of any situations in which the standard has been used as a baseline, or benchmark, for other energy efficiency programs or building designs?

Yes ☐ No ☐ Don't know ☐

If "Yes," please describe. _____

Section 6 - Conclusion

1. *Other Comments:*

Please comment here if you have additional ideas or information about the implementation of energy standards in your country/ region/ locality. For example, what do you consider the most successful and least successful parts of the energy efficiency standard? What do you consider most, and least, successful about its implementation and enforcement? How well has it been accepted by the building industry? What would you change?

2. *Name of Person Completing Form and Other Contacts:*

Please provide your name, address, and telephone numbers below. In addition, provide the names addresses and telephone numbers for other persons or information sources in your country whom you feel should respond to the questions raised in this survey. Please also include the names of persons who know details about the types of higher efficiency equipment that is available in the market in your area, for we have a separate two page questionnaire on that topic (if needed, use additional pages for list of contacts).

	Person Completing Survey	Other Contact	Other Contact
Name/ Title	<hr/>	<hr/>	<hr/>
Organization	<hr/>	<hr/>	<hr/>
Address	<hr/>	<hr/>	<hr/>
	<hr/>	<hr/>	<hr/>
Telephone	<hr/>	<hr/>	<hr/>
Fax	<hr/>	<hr/>	<hr/>
E-mail	<hr/>	<hr/>	<hr/>

This is the end of the survey. Thank you for participating!

If you would like a copy of our findings when we have compiled the results, please check this box: ☐

Please Return this Survey (Via Telefax or Airmail) to:

Dr. John F. Busch
Lawrence Berkeley National Laboratory
Energy Analysis Program, MS 90-4000
Berkeley, CA 94720 USA
Tel: 1-510-486-7279
Fax: 1-510-486-6996
e-mail: JFBusch@lbl.gov

Questions about the survey may be addressed to Dr. Busch at the above coordinates or to Mr. Joseph J. Deringer, AIA, Tel: 1-510-843-9000, Fax: 1-510-843-9005, e-mail: jderinger@classic.msn.com.

Definitions

For purposes of this survey, we define several key terms in specific ways.

- Standard:** For purposes of this survey, we use the word “standard” to refer interchangeably to what might also be called codes, criteria, guidelines, norms, laws, protocols, provisions, recommendations, requirements, regulations, rules, or standards.
- Depending on the country, the “standard” may be contained in one document, in several documents, or be part of another larger document (such as a general building code).
- Commercial:** All buildings that provide facilities for human occupancy and use energy primarily to provide human comfort. Includes buildings such as assembly facilities, health and institutional, hotel or motel, office, retail, restaurant, school, warehouse, etc., and multifamily dwellings, but excludes multifamily residential buildings of 3 or fewer stories above grade.
- Implementation:** This includes all activities on a standard *after* the standard has been developed (written in final draft form). It includes those activities that help to lay a foundation for the use of the standard prior to its adoption:
- development of compliance manuals, compliance forms, and compliance procedures;
 - conducting training courses and workshops;
 - field-testing the standard, the compliance forms and the compliance procedures;
 - and promoting, advertising and marketing the standard.
- “Implementation” activities also include adoption or promulgation of the code, whether mandatory or voluntary, and all ongoing day-to-day compliance and enforcement activities that occur after a standard is adopted, is “in place,” and is being used on a routine basis. Implementation activities also include monitoring and evaluation.
- Adoption:** This identifies the event when the standard has been formally or officially accepted or promulgated on either a voluntary or mandatory basis. For example, one country may officially adopt a first generation energy efficiency standard as a national voluntary standard. Another country may adopt a first generation energy efficiency standard as a mandatory standard.
- Compliance:** Performing the set of actions at the appropriate times in a building’s design, construction and retrofit process that allow the building to meet the minimum requirements for materials, components and systems, as specified in the standard.

Implementation of Standards for Energy Efficiency in Commercial Buildings

For Country: _____

The focus of this survey is on the **implementation** of energy efficiency standards for **commercial** buildings. From the information gathered, we hope to gain more clarity about those factors that contribute to successful implementation. Our intent is to widely distribute the information from this survey in order to assist interested persons in various localities to more effectively implement energy standards.

Note: The following terms are defined on the last page of this questionnaire: standard, implementation, compliance, guideline, commercial.

Section 1: Overview

1. *Regulations and Standards for Buildings:*

Does your country have building regulations, standards or codes of any kind (e.g., health, structural safety, fire prevention, etc.)? Does it also have standards for energy efficiency in buildings?

	Building codes or standards for health and life safety	Energy Efficiency Standards for Buildings
a) Being developed	<input type="checkbox"/>	<input type="checkbox"/>
b) Being implemented	<input type="checkbox"/>	<input type="checkbox"/>
c) Adopted, voluntary	<input type="checkbox"/> If yes when? _____	<input type="checkbox"/> If yes when? _____
d) Adopted, mandatory	<input type="checkbox"/> If yes when? _____	<input type="checkbox"/> If yes when? _____
e) None	<input type="checkbox"/>	<input type="checkbox"/>
f) Don't know	<input type="checkbox"/>	<input type="checkbox"/>

2. Are there any special circumstances about building standards in your country/ region/ locality? For example, are they implemented only at the national level, or is there separate implementation by region, state, province, or major city? Do the energy efficiency standards apply to just one or two building systems, such as lighting or space conditioning, and not to others, such as the building envelope?

If standards exist, or are being implemented, please complete the rest of the questionnaire.

If more than one standard exists, please choose one standard and answer all remaining questions relative to that standard! Give name of standard and applicable locality:

If building standards for energy efficiency in commercial buildings are NOT IN PLACE, for either voluntary or mandatory compliance, or standards are NOT BEING IMPLEMENTED at any level, then please STOP

HERE. Place your name and coordinates on page 9 of the questionnaire, and return just this page and page 9 via fax.

Section 2: Implementation Activities

A number of activities often are undertaken in implementing energy efficiency standards for commercial buildings. Please indicate below if any of these activities have occurred or if materials have been developed.

Part A: Overview Questions

	Yes	No	Don't know
7. Compliance Procedures: have been developed and distributed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Compliance Manuals: have been developed and published.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Compliance Forms: have been developed and published.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Field testing: compliance forms and/or procedures have been tested on some buildings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Training workshops: have been held	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Estimated Building Impacts:			
a) Energy Savings: have been estimated through calculation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Cost Effectiveness: has been estimated based on engineering economic calculations, professional judgment or other methods.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Measured Building Impacts:			
a) Energy Savings: have been calculated through measurement of actual buildings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Cost Effectiveness: has been calculated through measured savings achieved and actual costs incurred.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Public review process: is under way or has been completed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Marketing, advertising: or other promotional efforts have occurred to increase awareness of the standard.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Revision Update Process for standard:			
Is planned <input type="checkbox"/>			
Has been scheduled <input type="checkbox"/>			
Has been completed <input type="checkbox"/>			
No plans <input type="checkbox"/>			
Don't know <input type="checkbox"/>			
If revision is planned, scheduled, underway, or completed, which generation of the standard will result or has already resulted (second, third, fourth, etc.) _____.			

Part B: More Detailed Questions on Selected Implementation Activities

1. *Formal Training:*

If training courses or workshops been given to provide information about the energy codes or standards, please provide information about those courses.

Courses or workshops were held for:	Yes	No	Don't Know	If "Yes", then provide details if known		
				Number of courses	Number of persons trained	Days of training per person
a) Architects and Engineers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
b) Equipment suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
c) Code officials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
d) Owners and developers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
e) Bankers and real estate agents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____

2. *IF a Public Review Process has occurred for the standard:*

a) *About how many responses were received?*

10 or less <input type="checkbox"/>	11-50 <input type="checkbox"/>	51-100 <input type="checkbox"/>	100+ <input type="checkbox"/>	Don't know <input type="checkbox"/>	Actual number, if known _____
--	-----------------------------------	------------------------------------	----------------------------------	--	----------------------------------

b) *How extensive were the revisions to the standard as a result of the responses?*

Major revisions <input type="checkbox"/>	Modest revisions <input type="checkbox"/>	No revisions <input type="checkbox"/>	Don't know <input type="checkbox"/>
--	---	---------------------------------------	-------------------------------------

3. *Marketing, advertising, or other promotion of standard:*

If specific marketing and/or advertising activities have been done to increase awareness of the commercial standard, please indicate below the target audiences and your judgment of the effectiveness of the activities.

Marketing or advertising program to increase awareness of:	Yes	No	Don't Know	If "Yes," please estimate how effective		
				Very Effective	Somewhat Effective	Not Effective
a) Architects and engineers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Equipment suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Code officials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Owners and developers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Bankers and real estate agents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

From your experience, what are the most effective means to inform the building industry and the public about the existence of an energy standard and its effectiveness? How can these activities be effectively applied locally?

Section 3: Implementation Organizational Structure

1. *Type of organizational unit responsible for compliance with the energy standard:*

Oversight of compliance with the standard is located in the:

- | | |
|--|--------------------------|
| a) Government | <input type="checkbox"/> |
| b) Quasi-government (e.g., organization created by and funded by the government) | <input type="checkbox"/> |
| c) Private sector (e.g., professional society, business group) | <input type="checkbox"/> |
| d) No organization is responsible for compliance | <input type="checkbox"/> |
| e) Don't know | <input type="checkbox"/> |

Please give name or organization and discuss any special circumstances _____

1. *If government or quasi-government, what is primary responsibility of the compliance organizational unit:*

If the organizational unit overseeing compliance is government or quasi-government, then indicate the primary responsibility of the government agency.

Responsible for energy efficiency	Responsible for buildings	Other (please specify)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. *If in the private sector, what is the primary function of the compliance organizational unit:*

What is the primary type of organization

Utility	Non-government organization (NGO)	Professional society	Other (specify)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. *Primary Mission of the organizational unit overseeing compliance:*

Was this organizational unit pre-existing, or was the unit created specifically to implement the energy efficiency standard?

Pre-existing	Newly-created
<input type="checkbox"/>	<input type="checkbox"/>

4. *Staffing:*

Indicate the number of persons within the above-identified organizational unit who are actively involved in implementing the energy efficiency standard for commercial buildings. This includes promotion, training, enforcement, monitoring, evaluation, etc.

_____ number of full-time persons
_____ number of part-time persons

5. *Other Staffing:*

Please list and describe the organizations where such people are located _____

If applicable, indicate the number of persons *outside* of the organizational unit who are actively involved in implementing the energy efficiency standard for Commercial buildings, including promotion, training, enforcement, monitoring, evaluation, etc.

_____ number of full-time persons
_____ number of part-time persons

6. *Budget:*

Estimate the approximate annual budget for all implementation activities. _____ Monetary Units _____
or Don't know ☐

7. *Funding:*

has been provided from which sources? _____

Section 4: Implementation Procedures

1. Number of Buildings:

Indicate the number of buildings

that have gone through the compliance procedure:

	10 or less	11-50	51-100	100+	Don't know
a) since standard was implemented, and	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) in a recent year only _____(year).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Approximately how many commercial buildings are constructed each year, if known? _____					

1. How is compliance ensured or encouraged? (check all that apply)

Incentive:

Monetary award	<input type="checkbox"/>
Public award	<input type="checkbox"/>
Label of achievement (e.g., energy star)	<input type="checkbox"/>
Subsidized technical assistance	<input type="checkbox"/>

Penalty:

Stop or delay construction	<input type="checkbox"/>
Stop or delay occupancy of building	<input type="checkbox"/>
Requires replacing equipment/ materials	<input type="checkbox"/>
Monetary fine	<input type="checkbox"/>

Certification by designer, contractor, owner ☐

Other (specify) _____ ☐

No mechanisms ☐

Don't know ☐

2. Compliance - what is checked and when?

	Yes	No	Don't know
Prior to construction: Check of design documents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
During construction: Check of building energy elements via inspections.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check of "change orders" that modify design documents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
After construction: Check of "as-built" drawings or change orders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Check of building energy elements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: Checks unrelated to timing of construction (please explain).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Compliance Mechanisms:

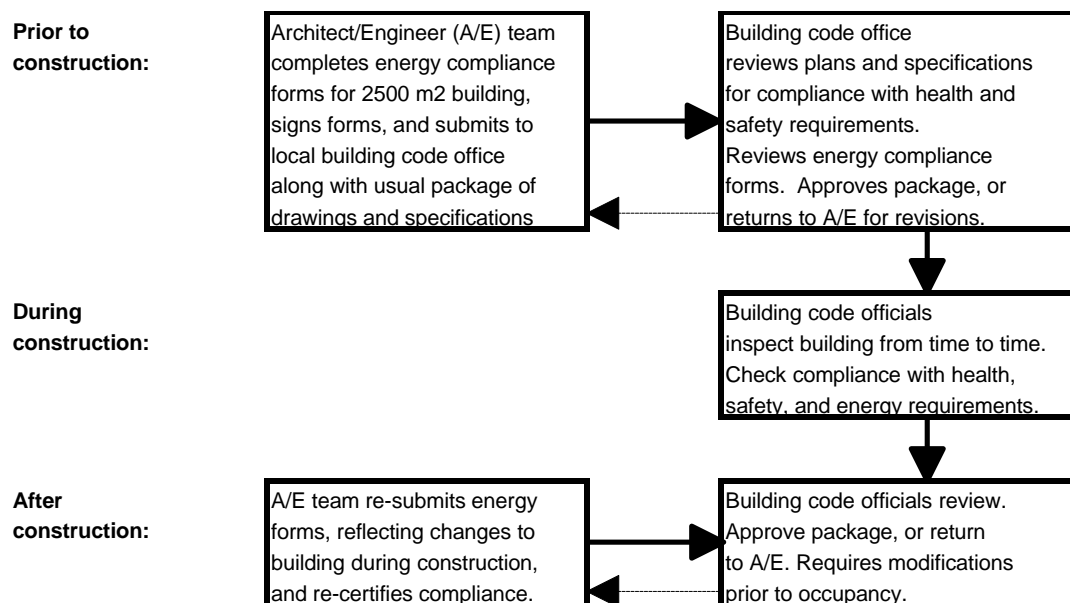
Is the standard part of the health and safety building codes or is it separate? Please answer the following options as appropriate:

a) The energy standard is included as of the building code.	Yes	No	Don't know
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Enforcement of the energy standard and the building code is by same organization.	Yes	No	Don't know
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) The same people check compliance with the energy standard and the building code.	Yes	No	Don't know
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) There are clear lines of authority relative to compliance and enforcement of the energy standard.	Yes	No	Don't know
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Comments? _____			

5. Compliance Process:

Draw your own diagram of the process as you understand it, or write a brief description of the process in the space below. For illustration purposes an example diagram is shown at the bottom of the page.

Illustrative Compliance Diagram



Section 5: Implementation Impact

1. *Effectiveness of Implementation:*

In your opinion, how effectively has the standard been implemented?

Very effective

☐

Somewhat effective

☐

Ineffective

☐

Don't know

☐

Please explain why it is effective or not effective.

2. *Factors enhancing or limiting effectiveness:*

In your opinion, which factors have enhanced or limited the effectiveness of implementation?

	Enhanced the effectiveness	Limited the effectiveness
a) Adequate <i>technical</i> capacity	<input type="checkbox"/>	<input type="checkbox"/>
b) Adequate <i>management</i> capacity	<input type="checkbox"/>	<input type="checkbox"/>
c) Adequate <i>institutional</i> capacity	<input type="checkbox"/>	<input type="checkbox"/>
d) Adequate funding	<input type="checkbox"/>	<input type="checkbox"/>
e) Motivation by building industry	<input type="checkbox"/>	<input type="checkbox"/>
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g) Program support by utilities	<input type="checkbox"/>	<input type="checkbox"/>
h) Presence of prominent <i>advocates</i> or <i>champions</i>	<input type="checkbox"/>	<input type="checkbox"/>
i) <i>Complexity of complying</i> with standard	<input type="checkbox"/>	<input type="checkbox"/>
j) <i>Stringency</i> of standard	<input type="checkbox"/>	<input type="checkbox"/>
k) Adequate <i>availability</i> of efficient equipment	<input type="checkbox"/>	<input type="checkbox"/>

1. *Improvement in Efficiency:*

Since the standard has been implemented, have you observed an improvement in the energy efficiency of buildings being designed and constructed:

a) In your country

Yes ☐

No ☐

Don't know ☐

b) In your region

Yes ☐

No ☐

Don't know ☐

c) In your locality

Yes ☐

No ☐

Don't know ☐

If "Yes," please describe which building systems (lighting, building envelope, HVAC, etc.) have improved in efficiency, and describe briefly what improvements have occurred.

1. *Very Efficient Buildings:*

Since the code was implemented, do you know of any buildings that have been designed and/or built that are significantly more energy efficient than the levels required in the energy code or standard?

Yes ☐ No ☐ Don't know ☐ If "Yes," about how many very efficient buildings? _____

If "Yes," indicate approximately how much more efficient than code: _____ (list if % or other units)

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To your knowledge, what is the extent of awareness by the following groups of the energy efficiency standard.

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g) General public	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. *Use by leading or most prestigious architecture and engineering firms:*

To your knowledge, are *any* of the most prestigious local architecture and engineering firms designing buildings that meet a voluntary standard or are much more energy efficient than a mandatory standard.

	Designing to standard	Designing much more efficient than standard	Don't know
a) Leading or prestigious architects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Leading or prestigious engineers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. *Collaboration:*

In your opinion, is there evidence of increased communication or collaboration between architects and engineers during the building design process as a result of the standard?

Yes ☐ No ☐ Don't know ☐

If "Yes," please describe. _____

8. *Standard as Benchmark or Baseline:*

Do you know of any situations in which the standard has been used as a baseline, or benchmark, for other energy efficiency programs or building designs?

Yes ☐ No ☐ Don't know ☐

If "Yes," please describe. _____

Section 6 - Conclusion

1. *Other Comments:*

Please comment here if you have additional ideas or information about the implementation of energy standards in your country/ region/ locality. For example, what do you consider the most successful and least successful parts of the energy efficiency standard? What do you consider most, and least, successful about its implementation and enforcement? How well has it been accepted by the building industry? What would you change?

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Please provide your name, address, and telephone numbers below. In addition, provide the names addresses and telephone numbers for other persons or information sources in your country whom you feel should respond to the questions raised in this survey. Please also include the names of persons who know details about the types of higher efficiency equipment that is available in the market in your area, for we have a separate two page questionnaire on that topic (if needed, use additional pages for list of contacts).

	Person Completing Survey	Other Contact	Other Contact
Name/ Title	<hr/>	<hr/>	<hr/>
Organization	<hr/>	<hr/>	<hr/>
Address	<hr/>	<hr/>	<hr/>
	<hr/>	<hr/>	<hr/>
Telephone	<hr/>	<hr/>	<hr/>
Fax	<hr/>	<hr/>	<hr/>
E-mail	<hr/>	<hr/>	<hr/>

This is the end of the survey. Thank you for participating!

If you would like a copy of our findings when we have compiled the results, please check this box: ☐

Please Return this Survey (Via Telefax or Airmail) to:

Dr. John F. Busch
Lawrence Berkeley National Laboratory
Energy Analysis Program, MS 90-4000
Berkeley, CA 94720 USA
Tel: 1-510-486-7279
Fax: 1-510-486-6996
e-mail: JFBusch@lbl.gov

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- Depending on the country, the “standard” may be contained in one document, in several documents, or be part of another larger document (such as a general building code).
- Commercial:*** All buildings that provide facilities for human occupancy and use energy primarily to provide human comfort. Includes buildings such as assembly facilities, health and institutional, hotel or motel, office, retail, restaurant, school, warehouse, etc., and multifamily dwellings, but excludes multifamily residential buildings of 3 or fewer stories above grade.
- Implementation:*** This includes all activities on a standard *after* the standard has been developed (written in final draft form). It includes those activities that help to lay a foundation for the use of the standard prior to its adoption:
- development of compliance manuals, compliance forms, and compliance procedures;
 - conducting training courses and workshops;
 - field-testing the standard, the compliance forms and the compliance procedures;
 - and promoting, advertising and marketing the standard.
- “Implementation” activities also include adoption or promulgation of the code, whether mandatory or voluntary, and all ongoing day-to-day compliance and enforcement activities that occur after a standard is adopted, is “in place,” and is being used on a routine basis. Implementation activities also include monitoring and evaluation.
- Adoption:*** This identifies the event when the standard has been formally or officially accepted or promulgated on either a voluntary or mandatory basis. For example, one country may officially adopt a first generation energy efficiency standard as a national voluntary standard. Another country may adopt a first generation energy efficiency standard as a mandatory standard.
- Compliance:*** Performing the set of actions at the appropriate times in a building’s design, construction and retrofit process that allow the building to meet the minimum requirements for materials, components and systems, as specified in the standard.